

# Components of the 400m Hurdles

By Ray Boyd

NATIONAL 400M HURDLE COACH-AUSTRALIA

FROM: Modern Athlete and Coach

The 400m hurdles race can be broken up into four stages:

- **Start to First Hurdle**
- **Movement Across Hurdle**
  - **On Straight**
  - **On Curve**
- **Running Between Hurdles**
- **Last Hurdle to Finish**

Each of the above parts must be understood and sufficient time allowed in the training program for the athlete to become familiar with the discipline needed to master each part of the event.

## START TO FIRST HURDLE

The blocks should be set so that the left leg leads over the first hurdle. Therefore, if the athlete takes an even number of strides to the first hurdle, then the left foot should be on the rear block, but on the front block for an odd number of strides. This will no doubt cause some concern to athletes who normally lead with the right over a hurdle and it may be necessary to allow the athlete to continue racing with a right leg lead over the first hurdle, until a level of proficiency has been reached with leading with the left leg. It is not necessary for the athlete to straighten quickly as in the sprint hurdles, due to the greater distance to the first hurdle, which allows for a normal sprint start to be adopted.

It is essential that the hurdle be taken without a "stutter" and therefore any minor adjustments to stride length should be made within the first few strides. A stutter will result in a loss of speed as the feet lose the positive movement necessary to maintain body momentum and, if the athlete is still too close to the hurdle at takeoff, will result in a "blocking action" and a "high jump" over the hurdle, with a consequential loss of momentum on both takeoff and landing.

It is also essential that the hurdler does not have to reach out on the last stride before the hurdle as this will result in a "long jump" being made to clear the hurdle and a consequential loss of momentum due to a propping or blocking action, caused by the foot landing well in front of the center of gravity.

Practice at running to the first hurdle is a "must." Unless it is undertaken at racing speed, it will most likely result in the athlete becoming confused during the race and over-stride, thereby arriving too close to the hurdle to take off effectively. It is difficult to simulate

racing conditions during each training session and fatigue, when a number of repetitions are undertaken, should be taken into account. Therefore, it may be desirable to bring the start forward say, 20 to 60cm during practice sessions.

A continual assessment must be made of the athlete's speed, as obviously the athlete should race faster towards the end of the track season. Increased stride length often accompanies increased speed and this increased stride length can sometimes result in the athlete having to change feet on the starting blocks to reduce by one the number of strides taken to the first hurdle to ensure a smooth attack across the hurdle.

Extreme wind conditions could also force the athlete to make a decision on the day of the race to change feet on the starting blocks, so as to reach the first hurdle in a position to allow for a left leg lead over the hurdle.

## **MOVEMENT OVER HURDLES**

### **On the Straight**

The action is similar to that required for the sprint hurdler but does not need to be as vigorous, due to the lower height of the hurdles. In fact, many high hurdlers, when moving up to the 400m hurdles make the mistake of taking their high hurdles action with them, thereby expending more energy than necessary when negotiating the hurdles.

The body lean over the hurdles should be obtained by striking quickly downwards and backwards with the takeoff leg, so that the foot lands close to a vertical line from the center of gravity. This action results in a "short" last stride before the hurdle and a natural forward rotation of the upper body without wasting energy in a vigorous body movement.

As soon as the takeoff foot strikes the ground, the lead leg is brought up quickly in what eventually becomes a step over the hurdle. The trail leg remains in contact with the ground for sufficient time to give full thrust over the hurdle and then recovered in a quick single movement, similar to a high hurdler's action.

### **On the Curve**

It is preferable to hurdle on a curve using a left leg lead for the following reasons:

- The athlete is able to keep closer to the line and therefore runs a shorter distance.
- There is less chance of being disqualified by dragging the trail foot over the side of the hurdle.
- The athlete can counteract the effect of centrifugal force by leaning to the left, whereas a right leg lead hurdler, attempting a similar lean, is in danger of the left knee hitting the hurdle or the athlete being forced to hurdle higher, wasting valuable energy.

When hurdling on a curve with a left leg lead, there should be a vigorous drive from the trail leg, accompanied by an anti-clockwise rotation of the upper body which should also

have leaned slightly to the left. At the same time the lead hip should be restrained so as not to cause the body to rotate clockwise about the vertical axis.

If the above action is not followed, then it is most likely that the lead foot will land to the right of lane center, thereby forcing the athlete to land off- balance and use unnecessary energy in making a recovery step to prevent him/her running out of the lane.

It is of course only possible to take all the hurdles on the bend with the left leg, if an odd number of strides between hurdles is adopted for the whole race. However, it is quite possible that a male athlete may wish to take 14 strides between hurdles (or a female hurdler 16 strides between hurdles) for the first half of the race, which will necessitate the second hurdle being taken with a right leg lead. This means that a technique alternating left and right leads over the hurdles must be taught if the athlete is to negotiate the hurdles without being disqualified.

Hurdling with a right leg lead on a curve requires the athlete to move to the center of the lane approximately 4 to 5 strides prior to the hurdle and attack straight across the center of the hurdle. Upon landing, the athlete should be able to move back to the inside of the lane within two to three strides. The action then is similar to that required when hurdling on the straight.

The usual hurdle drills should be practiced using both left and right as lead legs. The athlete should become as proficient with the "alternate" leg as with the "normal" lead leg, other- wise it is quite likely that when a decision has to be made for a change- down, the athlete will choose the "normal" lead leg.

## **RUNNING BETWEEN HURDLES**

If an athlete decides that an even stride pattern is to be adopted between hurdles for any part of the race, then it is essential that the athlete learns to hurdle proficiently with both a left and right leg lead. The advantages of being able to hurdle with both a left and right leg lead are obvious if a change-down in stride pattern is necessary .If an athlete cannot maintain, say, a 15-stride pattern for the entire race, then he/she is faced with taking either 16 or 17 strides for the remainder of the race.

The distance between landing after one hurdle and takeoff before the next is approximately 32m, which means that the "15 strider" has an average stride length of 2.13m. The "16 strider" has an average stride length of 2.00m (a reduction of 13cm per stride), and the "17 strider" an average stride length of 1.88m (a reduction of 25cm per stride).

It is extremely difficult to reduce stride length by 25cm, without a considerable reduction in speed. What often happens, particularly to the inexperienced hurdler, is the tendency to get too close to the hurdle, resulting in a stutter and a jump, followed by a sprint to the next hurdle, where another stutter occurs. This is repeated until the athlete has used up so much energy stuttering and jumping that the speed has dropped considerably, so that 17

strides places the athlete in a position where the correct position for take-off can be achieved without a stutter .

If an athlete is observed to be reaching for the takeoff stride, then a decision must be made as to whether the athlete should be told to either:

- increase speed with a consequential increase in stride length,
- consciously increase stride length immediately after clearing the preceding hurdle, or
- change-down so that one or two extra strides are taken between the hurdles.

The decision as to what corrective method should be used will depend upon how serious the reach or stutter is before the hurdle, the physical condition of the athlete, and at what stage in the race it occurs.

It is also necessary to determine whether the stutter is caused by a fear of the hurdles. The fear of being too far away from a hurdle and therefore risking "landing" on top of the hurdle, or having to run around the hurdle" can cause an athlete to over-stride when running off a hurdle and then stuttering before the next. It is only when confidence is gained that the athlete adopts a more economical stride pattern.

At all times the athlete must take off in a position so that the hurdle can be attacked in a positive manner, thereby minimizing the retarding effect that occurs while the hurdler is in flight over the hurdle. When a change-down has been affected, it is usually accompanied with a loss of velocity, even if the change-down is smooth.

The athlete will usually have easily reached the next hurdle after deciding to change-down and may therefore assume that the hurdle following the one where the new stride pattern was first adopted will also be reached easily. He consequently slows down by reducing effort. This could well result in the athlete either having to reach for the second hurdle after change-down, or be forced to change down again by stuttering before the hurdle. The athlete should therefore be made aware of this problem to realize that an increasing effort is required to maintain the same stride pattern between the hurdles following a change-down.

## **TECHNICAL TRAINING**

It is essential that the athlete become familiar with the rhythm required to achieve the desired race time. This requires practice at racing speed over up to eight hurdles. Of course the number of repetitions that can be undertaken reduces as the number of hurdles to be negotiated increases.

It is also difficult to simulate race conditions during training and it is quite likely that the athlete will be running slightly faster during the race than during training. If this is the case then it may be preferable to make an adjustment to the hurdle spacing during training sessions. This could take the form of bringing the hurdles closer by 30 to 60cm. The greater distance is used during the precompetitive phase and the shorter adjustment

during the competitive phase, when the athlete's speed (and stride length) should have increased.

Touchdown charts can be used during training to assess whether the athlete is running at sufficient speed to achieve the desired race time. The differential between the first 200m and the second is approximately two seconds, similar to a 400m flat runner. However, the timing for 200m during a training session is relatively difficult, whereas the timing of touchdown times at hurdle five is easy, and the addition of 1.7 seconds for the top male hurdlers and 2.3 seconds for the female hurdlers will give a reasonably accurate time for the first 200m.

The aim therefore should be to reach the 200m mark two seconds faster than that taken for the second 200m. If the effort required to fit the stride pattern results in a faster than necessary 200m, then it is quite possible that there has been too much energy expended over the first half of the race. This will lead to a much slower second half, as the athlete has not maximized his/her energy. The athlete may then need to consider increasing the number of strides between some, or all, of the hurdles in the first part of the race.

In the 400m hurdles event the potential to improve race time by an increased leg speed between hurdles is much greater than in the sprint hurdles. However, there are factors that are absent in the sprint hurdles which have an effect on the 400m hurdler. The 400m hurdler's leg speed between hurdles is influenced by stride pattern and fatigue, both of which have little influence on a high-performance sprint hurdler.

The number of strides taken between hurdles by the sprint hurdler is 52% of the total number of strides taken during the entire race, whereas the strides taken between hurdles for a 400m hurdler, taking 15 strides between hurdles, represents approximately 75% of the total number of strides taken during the entire race.

Theoretically then, the 15-stride hurdler, by increasing leg speed between hurdles by 1/100th sec. on each stride, should improve his/her over-all performance by 1.35sec.

This would also indicate that the hurdling ability of a 400m hurdler has reduced importance to the ability of the hurdler to be able to run a fast 400m and have sufficient ability to "fit" his/her stride pattern between landing after one hurdle and takeoff before the next.

To increase the amount of hurdle practice at racing speed, it is possible to decrease the spacing between hurdles and therefore the number of strides between hurdles. However, the hurdle spacing should be such that the athlete has to run at the same speed that he would to reach a hurdle set at the correct distance.

To demonstrate the above, the following assumptions are made for an athlete wishing to practice a 15- stride rhythm with hurdles set so that only seven strides are taken between hurdles:

- The first stride taken after a hurdle is 1.9m.

- The last stride before the next hurdle is 2.0m.
- The flight distance is 3.20m (male hurdler)
- Distance from takeoff to touchdown over one hurdle at racing speed = 3.20m
- Subtract the above from 35m (distance between hurdles) = 31.80m
- Subtract the first stride taken after a hurdle and the last stride before the next hurdle (3.9m) = 27.90m
- Divide the above by the number of strides that would be left between hurdles set at normal spacing (13) = 2.15m
- Multiply the above by the number of strides (less 21) between hurdles, selected for practice (say 5) = 10.75m
- Add to the above the distance from takeoff to touchdown over one hurdle (3.20m) = 13.95m
- Add to the above the distance of the last stride prior to and the first stride after hurdle (3.90m) = 17.85m

If a similar approach is applied to an athlete with a 14-stride pattern between hurdles, then for practice using a 6-stride rhythm, the hurdles should be set as follows:

$$31.8 - (1.9 + 2.0) = 27.9 / 12 = 2.32\text{m (average stride length for 12 strides)}$$

$$2.32 \times 4 + 1.9 + 2.0 + 3.0 = 16.40\text{m (spacing between hurdles)}$$

If it is desired to practice a change-down from a 14- to 15-stride pattern without the athlete running the full distance between hurdles, then a combination of the above hurdle spacings could be used, e.g., three hurdles spaced 16.40m apart between which six strides are taken from touchdown to takeoff, followed by another two hurdles spaced at 17.85m between which seven strides are taken.

The hurdles can be placed on the straight or on the bend, depending upon where the emphasis in training is required. The fifth hurdle is often used as a change-down point for a hurdler changing from 14 strides to 15. Therefore it is useful to practice the above drill by setting out, say, two or three hurdles at 16.4m prior to hurdle 5 and two or three hurdles at 17.85m from hurdle 5.

If practice at slightly less than racing speed is desired, then the markings on the front straight for 100m hurdles and 90m hurdles can be used. A hurdle can be set on every second mark (17m) of the 100m hurdles to practice a 15-stride rhythm (using seven strides between hurdles) and a hurdle set on every second mark (16m) of the 90m hurdles to practice a 14-stride rhythm (using six strides between hurdles).

If the fourth hurdle mark for the 100m hurdles and the third hurdle mark for the 90m hurdles is taken as a starting point (they coincide on the track) then the hurdles can be easily set out to enable practice of a change-down from a 14-to a 15-stride rhythm at slightly less than racing speed.

If the athlete's split times over three hurdles are recorded, then it is possible to use this exercise as a means of increasing the athlete's rhythm between hurdles. However, it is

suggested that athletes become confident at running between hurdles and maintaining a positive drive over each hurdle before attempting to improve time.

The same principle can be applied to other stride patterns and Table 1 sets out a guide to the approximate distances at which the hurdles may be placed.

13-Stride Rhythm—20m spacing for 7 strides
14-Stride Rhythm—16.5m spacing for 6 strides
14-Stride Rhythm—21m spacing for 8 strides
15-Stride Rhythm—17.7m spacing for 7 strides
16-Stride Rhythm—14.8m spacing for 6 strides
16-Stride Rhythm—18.8m spacing for 8 strides
17-Stride Rhythm—15.9m spacing for 7 strides
18-Stride Rhythm—13.4m spacing for 6 strides
18-Stride Rhythm—16.9m spacing for 8 strides
19-Stride Rhythm—14.5m spacing for 7 strides

**TABLE 1: Hurdles spacing for 400m hurdles training.**